

OBAMA et al. — 10/665,575
Attorney Docket: 008312-0306030

REMARKS

Claims 9-15 are pending. By this Amendment, claims 1-8 and 16 are canceled without prejudice or disclaimer and claims 9, 10, 13 and 14 are amended. Claims 11-15 are withdrawn from consideration as being drawn to a non-elected species, the requirement having been traversed. Reconsideration in view of the above amendments and following remarks is respectfully requested.

Claims 2, 9 and 10 were objected to. Claim 2 has been canceled without prejudice or disclaimer, thus rendering moot its objection. Claims 9 and 10 have been amended in accordance with the suggestion of the Office Action. Reconsideration and withdrawal of the of the objection are respectfully requested.

Claims 1, 2, 8-10 and 16 were rejected under 35 U.S.C. §112, second paragraph. Claims 1, 2, 8 and 16 have been canceled without prejudice or disclaimer, thus rendering moot their rejection. With respect to claim 9, lines 3-5 have been amended in accordance with the suggestion of the Office Action. With respect to claim 9, line 8, the claim has been amended to recite that a nozzle is provided in each opposite surface of a pair guide members. Support for the amendment may be found, for example, on page 10, lines 14-16 and Figure 4A. Claim 10 has been amended in accordance with the suggestion of the Office Action. Reconsideration and withdrawal of the rejection under 35 U.S.C. §112, second paragraph are respectfully requested.

Claims 1, 2, 8 and 16 were rejected under 35 U.S.C. §102(b) over Fraidenburgh (U.S. Patent 2,992,822). Claims 1, 2, 8 and 16 have been canceled without prejudice or disclaimer, thus rendering moot the rejection.

Claims 1, 2, 9 and 10 were rejected under 35 U.S.C. §102(b) over Kohama (Japanese Patent Publication 2001-233501). The rejection is respectfully traversed.

Claims 1 and 2 have been canceled without prejudice or disclaimer, thus rendering moot their rejection.

It is respectfully submitted that Kohama cannot anticipate or render obvious claim 9 as Kohama do not disclose or suggest a pair of guide members wherein one of the pair guide members is fixed and the other guide member is removable relative to the one guide member. As disclosed in the attached English translation of Kohama in paragraph [0093], the guide bases 91 and 92, which the Office Action on page 5 equates with the guide device of claim 9, are attached in the supporter 100 through flat springs 93 and 94, respectfully. According to

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the structure, the opposite surface of the guide bases 91 and 92 cannot be easily made parallel and vibration of a paper sheet conveying surface often occurs, unlike the guide device of claim 9 in which one of the pair of guide members is fixed while the other guide member is removable relative to the one guide member. Accordingly, Kohama cannot anticipate or render obvious claim 9.

Claim 10 recites additional features of the invention and is allowable for the same reasons discussed above with respect to claim 9 and for the additional features recited therein.

Reconsideration and withdrawal of the rejection under 35 U.S.C. §102(b) over Kohama are respectfully requested.

Claims 11-15 recite additional features of the invention and are allowable for the same reasons discussed above with respect to claim 9 and for the additional features recited therein. Applicants respectfully request withdrawal of the Election of Species Requirement, rejoinder of claims 11-15 and allowance of claims 9-15.

In view of the above amendments and remarks, Applicants respectfully submit that all claims are allowable and that the entire application is in condition for allowance.

Should the Examiner believe that anything further is desirable to place the application in better condition for allowance, the Examiner is invited contact the undersigned at the telephone number listed below.

Respectfully submitted,

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JP2001-233501 (English translation)

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CLAIMS

[Claim(s)]

[Claim 1] The elastic body of the shape of a film of the pair arranged in the condition that it is prepared face to face across the conveyance side of paper leaf, and the point forces each other in the above-mentioned conveyance side, A supplied-air means to send in a compression gas and to form a fixed clearance between points between the points of the elastic body of these pairs, Property detection equipment of the paper leaf characterized by having the detector element which detects the property of the paper leaf which is prepared in one [at least] above-mentioned point of the elastic body of a top Norikazu pair, and passes through the above-mentioned clearance along the above-mentioned conveyance side.

[Claim 2] Property detection equipment according to claim 1 with which two or more pairs of elastic bodies of the Norikazu pair after having the above-mentioned detector element are installed along the conveyance direction of paper leaf, and the direction which intersects perpendicularly, and the above-mentioned supplied-air means is characterized by sending in a compression gas between the points of the elastic body of above-mentioned two or more pairs.

[Claim 3] The above-mentioned detector element is property detection equipment according to claim 1 characterized by detecting change of the above-mentioned clearance by passage of paper leaf, and detecting the thickness of this paper leaf.

[Claim 4] The above-mentioned detector element is property detection equipment according to claim 3 characterized by having the printed coil printed on the above-mentioned elastic body.

[Claim 5] The above-mentioned detector element is property detection equipment according to claim 1 characterized by detecting the magnetic substance of the ink printed by the paper leaf which passes through the above-mentioned clearance.

[Claim 6] The above-mentioned detector element is property detection equipment according to claim 1 characterized by being a magnetic resistance element.

[Claim 7] The above-mentioned magnetic resistance element is property detection equipment according to claim 6 characterized by preparing more than one in the equidistant location from the above-mentioned conveyance side.

[Claim 8] The property detection equipment of the paper leaf which carries out [having the detector element which detects the magnetic properties of the paper leaf which is countered and prepared across the conveyance side of paper leaf, distance is changed from the above-mentioned conveyance side in one / at least / above-mentioned point of the elastic body of the shape of a film of the pair arranged in the condition that the point forces each other in the above-mentioned conveyance side, and the elastic body of these pairs, is prepared, and passes through the above-mentioned conveyance side, and] as the description. [two or more]

[Claim 9] The above-mentioned supplied-air means is property detection equipment according to claim 1 characterized by having the supplied-air way into which a compression gas is sent towards the above-mentioned conveyance side through the hole which penetrated the point of each elastic body of the above-mentioned pair, and these holes.

[Claim 10] The above-mentioned supplied-air way is property detection equipment according to claim 9 characterized by being installed in the direction which separates from the above-mentioned point along with the elastic body of the above-mentioned pair.

[Claim 11] The plate-like part material of the pair energized in the direction which it is prepared face to face across the conveyance side of paper leaf, and the opposed face has predetermined die length along the conveyance direction of paper leaf, and is forced mutually, The detector element which detects the magnetic substance of the ink printed by the paper leaf which is prepared at least in one side of the plate-like part material of these pairs, and is conveyed along the above-mentioned conveyance side, Two or more holes prepared by penetrating the plate-like part material of the top Norikazu pair in the physical relationship whose detector element of this is pinched along the above-mentioned conveyance direction, Property detection equipment of the paper leaf characterized by having a supplied-air means to send in a compression gas between the opposed faces of the plate-like part material of the above-mentioned pair, and to form a fixed clearance between the opposed faces of the above-mentioned pair, through the hole of these plurality.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the property detection equipment which detects the property of paper leaf, such as the magnetic substance of the ink printed by the thickness of paper leaf, and paper leaf.

[0002]

[Description of the Prior Art] Paper leaf is conventionally conveyed through between the movable rollers which countered the fixed roller with the fixed roller [which has been arranged fixed to the conveyance side down side of paper leaf as property detection equipment which detects the thickness of paper leaf], and conveyance side up side, and were formed possible [disjunction] to the fixed roller. The equipment which detects the amount of displacement of a movable roller in case paper leaf passes through between a roller pair, and detects the thickness of paper leaf from the amount of displacement of this movable roller is known. Moreover, he installs two or more pairs of rollers in the conveyance direction and the direction which intersects perpendicularly, and is trying to measure distribution of the thickness which met crosswise [of paper leaf] with this kind of equipment.

[0003] Thus, by the method which sees the amount of displacement of a movable roller and detects the thickness of paper leaf, since the movable roller itself has a certain amount of weight, the paper jam (jam) of paper leaf may occur with the self-weight of a movable roller. Moreover, the flattery nature of a movable roller to an abrupt change which stuck the tape on the omission or paper leaf of tip inrush of paper leaf or the back end it runs is bad, and a limitation is in the bearer rate of paper leaf. Moreover, when putting two or more roller pairs in order and detecting a crosswise thickness distribution, it was difficult to secure the tooth space for the supporter material which supports the revolving shaft of each movable roller between each roller, to be unable to stick two or more movable rollers crosswise, and to be unable to install them, but to raise crosswise resolution. Furthermore, if it vibrates in the thickness direction according to a certain cause while paper leaf runs, in order to detect vibration of this paper leaf as an amount of displacement of a movable roller, there were problems, like detection precision worsens. Moreover, from on manufacture, since it was necessary to raise the process tolerance of the supporter material of a movable roller or a movable roller, to press down small the shakiness at the time of rotation of a movable roller, and to secure detection precision, there was a problem from which a manufacture price becomes expensive.

[0004] Moreover, as other property detection equipments which detect the thickness of paper leaf, by the physical relationship which faces across the conveyance side of paper leaf, it counters up and down and an optical range finder is installed, light is applied to the top face and inferior surface of tongue of paper leaf, the reflected light is detected, the distance to the top face of paper leaf and the distance to an inferior surface of tongue are measured, respectively, and there are some which detect the difference of both measurement results as thickness.

[0005] Thus, by the method which detects thickness using an optical range finder, since the amount of reflected lights of light changed with colors of paper leaf, the error was produced in the detection result

and there was a case where thickness was correctly undetectable. Moreover, the optical range finder without the effect by color was expensive, and since the dimension was large, it had problems -- an installation is restricted.

[0006] Moreover, as property detection equipment which detects the magnetic substance of the ink printed by paper leaf, and identifies paper leaf, a primary coil is prepared in the center section of the core of for example, a S character mold, and a secondary coil is prepared in each by the side of two openings set as the very small gap, it approaches on one opening, paper leaf is passed, and the differential-winding mold trans-form method which detects the difference of the induced voltage of two secondary coils is learned.

[0007] Moreover, the annular core impedance method which prepares a gap very small to a part of annular core which prepared the coil as other property detection equipments which detect the magnetic substance, detects change of the impedance of the coil at the time of paper leaf passing through this gap top, and detects the amount of magnetic substance is learned.

[0008] However, by these differential-windings mold trans-form method or the annular core impedance method, a detection signal will decrease rapidly as the detection signal at the time of passing through the gap top of a core while paper leaf contacts serves as max and paper leaf separates from the gap of a core. For this reason, if paper leaf vibrates according to a certain cause, a detection signal will decrease, especially if paper leaf separates more than the gap of a core, a detection signal will almost become zero. That is, since paper leaf becomes easy to vibrate when conveying paper leaf at a high speed, it is possible that a detection signal becomes unstable.

[0009] Furthermore, the equipment indicated by JP,59-141058,A is known as property detection equipment which detects the magnetic substance by non-contact to paper leaf. With this equipment, the character type core of two KO is made to counter through a gap, the coil wound around each core is connected to a serial, change of the impedance at the time of paper leaf passing through a gap is detected, and the amount of magnetic substance is detected.

[0010] However, by this non-contact type of detection method, in order to detect the magnetic substance in both sides of the paper leaf which countered two cores, respectively, when the amount of magnetic substance of each field of paper leaf is the same, the detection signal detected with both coils becomes twice the detection signal detected with coil of one of the two. For this reason, it was difficult to specify the amount of magnetic substance. Moreover, since a detection signal was outputted whichever the magnetic substance is in the field of paper leaf, a location with the magnetic substance was not able to be pinpointed. Furthermore, since the permeability of a core changes with change of ambient temperature, it was tended to change a detection signal.

[0011] Moreover, the property detection equipment which the core of two J character molds was made to counter is indicated by JP,9-236642,A. This equipment connects to a serial the coils which made edges with each longer core counter, and short edges were made to counter, wound the coil around the edge of each core, and were wound around the edge of the longer one, connects to a serial the coils wound around the edge of the shorter one, and is constituted. And comparatively, the comparatively large clearance where the slit and the edge of the shorter one when the edge of the longer one countered countered is made to pass paper leaf, the difference of the impedance of the coil connected to the serial, respectively is detected, and the magnetic substance is detected.

[0012] However, by this detection method, the work process of a J character mold core was complicated, and since special processing was needed for immobilization of a J character mold core, there was a problem on which work costs increase. Moreover, in order that the distance between the paper leaf and edges which pass through the clearance which the edge of the shorter one was made to counter might separate greatly, there was a problem in which the detection power which met in the migration direction of paper leaf compared with the differential-winding mold transformer method and annular core impedance method which were mentioned above is inferior.

[0013]

[Problem(s) to be Solved by the Invention] As mentioned above, with conventional property detection equipment, the satisfying detection result of having been stabilized was not able to be obtained from it

being difficult to always hold uniformly the distance between the paper leaf as a detection object conveyed at high speed, and a detector element in which equipment.

[0014] This invention was made in view of the above point, and that purpose can always hold uniformly the distance between the paper leaf and detector elements which are conveyed at high speed, and is to offer the property detection equipment which can obtain the reliable stable detection result.

[0015]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, the property detection equipment of this invention The elastic body of the shape of a film of the pair arranged in the condition that it is prepared face to face across the conveyance side of paper leaf, and the point forces each other in the above-mentioned conveyance side, It was prepared in one [at least] above-mentioned point of a supplied-air means to send in a compression gas and to form a fixed clearance between points between the points of the elastic body of these pairs, and the elastic body of the above-mentioned pair, and has the detector element which detects the property of the paper leaf which passes through the above-mentioned clearance along the above-mentioned conveyance side.

[0016] According to the above-mentioned invention, with a supplied-air means, paper leaf is conveyed through the clearance by the layer of the compression gas formed between the points of the elastic body of a pair, and the property of paper leaf is detected through the detector element prepared in the point of an elastic body. Paper leaf can be conveyed in the state of non-contact to an elastic body, by this, since an elastic body follows even if paper leaf vibrates, the distance between a detector element and paper leaf can be kept constant, and the reliable detection result of having been stabilized can be obtained.

[0017] Moreover, according to invention mentioned above, two or more pairs of elastic bodies of the Norikazu pair after having the above-mentioned detector element are installed along the conveyance direction of paper leaf, and the direction which intersects perpendicularly, and the above-mentioned supplied-air means is characterized by sending in a compression gas between the points of the elastic body of above-mentioned two or more pairs. Thereby, the property of paper leaf is detectable along the cross direction which intersects perpendicularly with the conveyance direction of paper leaf.

[0018] Moreover, according to invention mentioned above, the above-mentioned detector element detects change of the above-mentioned clearance by passage of paper leaf, and detects the thickness of this paper leaf.

[0019] Moreover, according to invention mentioned above, the above-mentioned detector element has the printed coil printed on the above-mentioned elastic body.

[0020] Moreover, according to invention mentioned above, the above-mentioned detector element detects the magnetic substance of the ink printed by the paper leaf which passes through the above-mentioned clearance.

[0021] Moreover, according to invention mentioned above, the above-mentioned detector element is a magnetic resistance element.

[0022] Moreover, according to invention mentioned above, two or more above-mentioned magnetic resistance elements are prepared in the equidistant location from the above-mentioned conveyance side.

[0023] Moreover, across the conveyance side of paper leaf, the property detection equipment of this invention countered and was formed, distance was changed from the above-mentioned conveyance side in one [at least] above-mentioned point of the elastic body of the shape of a film of the pair arranged in the condition that the point forces each other in the above-mentioned conveyance side, and the elastic body of these pairs, more than one were prepared, and it has the detector element which detects the magnetic properties of the paper leaf which passes through the above-mentioned conveyance side.

[0024] Moreover, according to invention mentioned above, the above-mentioned supplied-air means has the supplied-air way into which a compression gas is sent towards the above-mentioned conveyance side through the hole which penetrated the point of each elastic body of the above-mentioned pair, and these holes.

[0025] Moreover, according to invention mentioned above, the above-mentioned supplied-air way is installed in the direction which separates from the above-mentioned point along with the elastic body of the above-mentioned pair.

[0026] Furthermore, the plate-like part material of the pair energized in the direction which the property detection equipment of this invention counters, and is formed across the conveyance side of paper leaf, and the opposed face has predetermined die length along the conveyance direction of paper leaf, and is forced mutually, The detector element which detects the magnetic substance of the ink printed by the paper leaf which is prepared at least in one side of the plate-like part material of these pairs, and is conveyed along the above-mentioned conveyance side, Two or more holes prepared by penetrating the plate-like part material of the top Norikazu pair in the physical relationship whose detector element of this is pinched along the above-mentioned conveyance direction, Through the hole of these plurality, the compression gas was sent in between the opposed faces of the plate-like part material of the above-mentioned pair, and it has a supplied-air means to form a fixed clearance between the opposed faces of the above-mentioned pair.

[0027] The plate-like part material of the pair which has predetermined die length along the conveyance direction of paper leaf is arranged face to face across the conveyance side of paper leaf, through two or more holes which penetrate each plate-like part material by the physical relationship whose detector element prepared in one [at least] plate-like part material is pinched along the conveyance direction, between the plate-like part material of a pair, a compression gas is sent in and, according to the above-mentioned invention, a fixed clearance is formed between opposed faces. Thus, by sending in a compression gas through the hole whose detector element make the opposed face of the plate-like part material which has predetermined die length along the conveyance direction counter, and is pinched, between the opposed faces which have the fixed size of the plate-like part material of a pair, it is stabilized and a fixed clearance can be formed.

[0028]

[Embodiment of the Invention] Hereafter, the gestalt of implementation of this invention is explained to a detail, referring to a drawing.

[0029] The outline configuration of the thickness detection equipment 10 (detection equipment 10 is only called hereafter) which detects the thickness of the paper leaf conveyed through the conveyance side which extended to the abbreviation horizontal direction at high speed as property detection equipment concerning the gestalt of implementation of the 1st of this invention is shown in drawing 1. The top view which looked at detection equipment 10 from the upper part of a conveyance side is shown in drawing 2.

[0030] As shown in drawing 1, the paper leaf 1 as a detection object is comparatively conveyed in the direction of drawing Nakaya mark A through the inside of detection equipment 10 at high speed along a predetermined conveyance side, being pinched by conveyance means, such as a conveyance belt which is not illustrated.

[0031] Elastic bodies 2 and 3 fix the end face section with Supporters 6a and 6b, and are arranged by the physical relationship which sandwiches paper leaf 1 at the both sides of a conveyance side so that it may be energized in the direction which the point forces mutually towards a conveyance side. The coils 4 and 5 as a detector element are attached in the point of the elastic bodies 2 and 3 which counter each side of paper leaf 1, respectively. The terminal lines 7 and 8 of coils 4 and 5 are connected to the circuit mentioned later.

[0032] Moreover, the elastic tubes 9a and 9b are connected to the point of each elastic bodies 2 and 3 through splices 11 and 12, respectively. The elastic tubes 9a and 9b are installed in the direction which separates from a conveyance side. Furthermore, the holes 13 and 14 penetrated towards the conveyance side from the outside of an elastic body are formed in the point of each elastic bodies 2 and 3, respectively. A deer is carried out, if compression gases, such as air compressed into the predetermined pressure through the elastic tubes 9a and 9b, are supplied, a compression gas will be sent in towards a conveyance side through the holes 13 and 14 of the point of each elastic bodies 2 and 3, it can extend in the direction which the point of each elastic bodies 2 and 3 repels mutually, and a fixed clearance will be formed among both.

[0033] As shown in drawing 2, while is above the conveyance side, and the elastic body 2 is making the long and slender rectangle band-like with which the end is supported by supporter 6a, and as mentioned

above, a coil 4, a splice 11, and elastic tube 9a are attached in the point. On the other hand, the elastic body 3 of another side which has a conveyance side caudad has the configuration of the above-mentioned elastic body 2 and abbreviation identitas. Each elastic bodies 2 and 3 are positioned so that the holes 13 and 14 which the coil 4 prepared in the point of an elastic body 2 and the coil 5 prepared in the point of an elastic body 3 countered through the conveyance side, and penetrated each elastic bodies 2 and 3 may counter concentrically through a conveyance side.

[0034] In drawing 1 and drawing 2, when there is no paper leaf 1 on a conveyance side, elastic bodies 2 and 3 tend to contact so that one another may be pushed mutually, but since the compression gas is sent in among both through the elastic tubes 9a and 9b and holes 13 and 14, few clearances by the layer of a compression gas are formed between the points of each elastic bodies 2 and 3. Although this clearance changes according to the flow rate of a compression gas, he is trying to keep a clearance constant by keeping the flow rate of a compression gas constant with the gestalt of this operation.

[0035] If paper leaf 1 is conveyed in the direction of an arrow head A and enters between the points of elastic bodies 2 and 3 through a conveyance side in this condition, while the point of the elastic body 2 arranged above the conveyance side can extend in the direction (upper part) of drawing Nakaya mark B. The point of the elastic body 3 arranged down the conveyance side can extend in the direction of drawing Nakaya mark C (lower part), the clearance between each elastic body 2 and 3 can extend, and a predetermined clearance is formed between the point of each elastic bodies 2 and 3, and paper leaf 1, respectively. That is, paper leaf 1 is conveyed through between each elastic body 2 and 3, without contacting the elastic bodies 2 and 3 arranged at the both sides of a conveyance side. In addition, since change of the clearance between the elastic body 2 by passage of the paper leaf 1 at this time and 3 originates in the thickness of paper leaf 1, it can detect the thickness of paper leaf 1 by detecting the variation of the distance between the variation 4 of a clearance, i.e., a coil, and 5.

[0036] Here, the configuration of the important section of the detection equipment 10 mentioned above is further explained to a detail. The detail drawing which expanded the point of elastic bodies 2 and 3 is shown in drawing 3. The top view of a coil 4 established in the elastic body 2 is shown in drawing 4 (a), and the sectional view of a coil 4 is shown in drawing 4 R> 4 (b).

[0037] As shown in drawing 3, an elastic body 2 makes elastic film 2a, such as the abbreviation rectangle band-like of two sheets, for example, a polyimide film etc., and 2b rival by viscous-element 2c, such as a pressure sensitive adhesive double coated tape, and while it has been arranged above the conveyance side is formed. This viscous-element 2c functions as a damping member (buffer) which absorbs vibration [**** / un-] produced in the point of elastic film 2a and 2b by passage of paper leaf 1. The elastic body 3 of another side also makes the elastic films 3a and 3b of two sheets as well as the above-mentioned elastic body 2 rival by viscous-element 3c, and is formed.

[0038] The coil 4 (4a, 4b) and the coil 5 (5a, 5b) are formed, respectively on both sides of the elastic films 2a and 3a of the side (outside) estranged from the conveyance side of each elastic bodies 2 and 3. These coils 4 and 5 are constituted by the printed coils 4a, 4b, 5a, and 5b formed in both sides of each elastic films 2a and 3a, and are concentrically formed with the holes 13 and 14 which penetrated the point of each elastic bodies 2 and 3. With the gestalt of this operation, although each coils 4 and 5 were concentrically formed with holes 13 and 14, it is not necessary to necessarily form coils 4 and 5 and holes 13 and 14 concentrically.

[0039] As shown in drawing 4 (a) and drawing 4 (b), in the point of outside elastic film 2a, one coil 4 (4a, 4b) makes a conductive print wire a curled form, and is formed in both sides of film 2a. each coils 4a and 4b are formed in the same direction of a volume by both sides of elastic film 2a -- having -- a through hole -- a conductor -- the coils 4a and 4b of a front flesh side are electrically connected by 4c. The terminal lines 7a and 7b are drawn from the edge of these coils 4a and 4b, respectively. In addition, it has the configuration as a coil 4 also with the same coil 5 (5a, 5b) of another side, and the terminal lines 8a and 8b are drawn.

[0040] In the point of each above-mentioned elastic bodies 2 and 3, the splices 11 and 12 for attaching the elastic tubes 9a and 9b are attached on the external surface of the outside elastic films 2a and 3a, respectively. In order that each splices 11 and 12 may attach the elastic tubes 9a and 9b, it has the

anchoring holes 11a and 12a penetrated and prolonged, and the elastic tubes 9a and 9b are fixed to each anchoring holes 11a and 12a through adhesive adhesives, respectively. Thus, the splices 11 and 12 with which the elastic tubes 9a and 9b were fixed are positioned so that each anchoring hole 11a and 12a (namely, elastic tubes 9a and 9b) may serve as concentric [which were formed in the point of each elastic bodies 2 and 3 / the holes 13 and 14 and concentric], and they are fixed through adhesive adhesives on outside elastic film 2a and 3a.

[0041] The outline configuration of the property detection equipment 100 (detection equipment 100 is only called hereafter) as a modification which installed two or more detection equipments 10 constituted as mentioned above in drawing 5 side by side along the conveyance direction of paper leaf 1 and the direction (cross direction) which intersects perpendicularly is shown as a top view. This detection equipment 100 carries out support immobilization of the detection equipment 10 mentioned above, n detection equipments 10a, 10b, 10c, 10d, and 10e constituted similarly, and the end face section of each —10n elastic bodies 2 and 3 with one supporter 60, and is constituted.

[0042] With this detection equipment 100, the thickness of paper leaf 1 is detected through the coils 4 and 5 prepared in the pair of each elastic body 2 and 3, and the thickness distribution which met crosswise [of paper leaf 1] is detected. Moreover, the resolution of the thickness distribution which increased the number of elastic bodies 2 and 3, and met crosswise [of paper leaf] can be raised with this detection equipment 100 by narrowing spacing of the elastic bodies 2 and 3 which made width of face of each elastic bodies 2 and 3 small to extent which does not affect detection precision, and adjoined crosswise.

[0043] By processing the detection signal about the thickness of the paper leaf outputted to drawing 6 through the detection equipment 10 (100) mentioned above has shown the block diagram of the thickness detector 20 which detects the thickness of paper leaf.

[0044] As shown in drawing 6, a bridge circuit 22 Two fixed resistors R1 and R2, Sensing coil 22a which connected with the serial the coils 4 and 5 of the detection equipment 10 mentioned above through the above-mentioned terminal lines 7 and 8, dummy coil 22b which gave the gap fixed two printed coils like coils 4 and 5, connected the coils D1 and D2 of each superposition with the serial, and constituted them — since — it is constituted. The inductance L of sensing coil 22a is set to $L=L1+L2+2M$ when the **** inductance between L2, a coil 4, and a coil 5 is set [the inductance of a coil 4] to M for the inductance of L1 and a coil 5. Since the sense of the line of magnetic force which a coil 4 generates of the **** inductance M is the same as the sense of the line of magnetic force which a coil 5 generates, it serves as a forward value.

[0045] Sensing coil 22a and dummy coil 22b are connected so that a bridge circuit 22 may be in a balance condition by the resistor for balance adjustment which adjusts the difference of an impedance value and which is not illustrated. In addition, dummy coil 22b is prepared in order to lessen the error produced when changing the output of sensing coil 22a by environmental variations, such as temperature.

[0046] The alternating current oscillator circuit 23 supplies and energizes alternating voltage to a bridge circuit 22. The value pressured partially by the value with which the alternating voltage from the alternating current oscillator circuit 23 was pressured partially by a resistor R1 and sensing coil 22a, and a resistor R2 and dummy coil 22b is supplied to a differential amplifying circuit 24. The output of the thickness signal according to change of the coils 4 and 5 of this differential amplifying circuit 24 is supplied to the synchronous-detection circuit 25. The same alternating voltage as the alternating voltage from the alternating current oscillator circuit 23 to the above-mentioned bridge circuit 22 is supplied, and phase setting circuitry 26 is made into the setting phase of a request of the AC signal, and is supplied to the synchronous-detection circuit 25. Detection rectification is carried out to the thickness signal of the paper leaf from a differential amplifying circuit 24 under the phase conditions that the sensibility from phase setting circuitry 26 is high, and the synchronous-detection circuit 25 is outputted to a filter and an amplifying circuit 27. A filter and an amplifying circuit 27 reduce the ripple of the signal by which detection rectification was carried out in the synchronous-detection circuit 25, and outputs a thickness signal as direct current voltage (the average is taken and direct-current-ized).

[0047] Next, an operation of the detection equipment 10 constituted as mentioned above is explained.

[0048] In drawing 1 and 2, it is in the elastic body 2 of a pair, and the condition that the compression gas is not sent in among three, and when paper leaf 1 is not having passed through a conveyance side, elastic bodies 2 and 3 touch so that one another may be mutually pushed by the predetermined pressure. The fixed clearance by thin liquid film is formed by sending in a compression gas between the elastic body 2 of a pair, and 3 from this condition, and paper leaf 1 is conveyed along a conveyance side through this clearance.

[0049] If the paper leaf 1 of predetermined thickness passes the elastic body 2 of a pair, and the fluid layer between three (air gap), one elastic body 2 can be extended in the direction of drawing Nakaya mark B, and can extend the elastic body 3 of another side in the direction of drawing Nakaya mark C. In this condition, the compression gas sent into the clearance flows, as arrow heads D and E show to drawing 3, and liquid film with thin, respectively fixed thickness is formed between one elastic body 2 and the top face of paper leaf 1, and between the elastic body 3 of another side, and the inferior surface of tongue of paper leaf 1. At this time, by the theorem of bell NUI, the negative pressure according to the rate of flow of a compression gas arises between paper leaf 1 and each elastic bodies 2 and 3, and the clearance between paper leaf 1 and each elastic bodies 2 and 3 is stabilized more.

[0050] Thus, the gap of the coil 4 attached in the point of each elastic bodies 2 and 3 and a coil 5 can extend by passing paper leaf 1 through the clearance which consists of a fluid layer. The variation of the clearance between this coil 4 and 5 is proportional to the thickness of the paper leaf 1 which passes through a conveyance side. Since a coil 4 and a coil 5 are in a connection condition electrically, if the distance between both changes, the coupled impedance of a coil will change. If coupled impedance changes, the balance condition of a bridge circuit 22 of having explained using drawing 6 will collapse, the alternating current output voltage of a differential amplifying circuit 24 will change, and the direct-current output signal of a filter and an amplifying circuit 27 will change. That is, the variation of this direct-current output signal is detected, and the thickness of paper leaf 1 is detected.

[0051] By the way, when paper leaf 1 carries out inrush at a tip, and the omission of the back end between an elastic body 2 and 3, the tip of elastic bodies 2 and 3 vibrates while displacing it rapidly. In addition, when the tape etc. is stuck on paper leaf 1, it is possible that the point of elastic bodies 2 and 3 vibrates un-wanting. In order to control vibration [**** / un-] of these elastic bodies 2 and 3, as shown in drawing 3, each elastic bodies 2 and 3 stick between elastic film 2a, 2b, and the elastic films 3a and 3b with the pressure sensitive adhesive double coated tapes 2c and 3c which are buffers, are constituted, and have given buffer action according to the viscosity of these pressure sensitive adhesive double coated tapes 2c and 3c. That is, vibration [**** / un-] of elastic bodies 2 and 3 was absorbed with the adhesive tape 2c and 3c which made each elastic film rival, and the rapid variation rate of the coils 4 and 5 attached in the point of each elastic bodies 2 and 3 is controlled. Therefore, with the detection equipment 10 of the gestalt of this operation, vibration [**** / un-] of paper leaf 1 is certainly absorbable with the buffer action of each elastic bodies 2 and 3, it is stabilized and the thickness of paper leaf 1 can be detected.

[0052] For example, when paper leaf 1 vibrates un-wanting and displaces in the direction of arrow-head B by drawing 1, the point of one elastic body 2 is pushed up by paper leaf 1, and deforms, and the elastic body 3 of another side follows in footsteps of paper leaf 1 according to the stability, and deforms in the direction of arrow-head B. For this reason, even if paper leaf 1 displaces in the direction of arrow-head B, the gap of a coil 4 and a coil 5 does not change. Moreover, when paper leaf 1 displaces in the direction of drawing Nakaya mark C, elastic bodies 2 and 3 follow in footsteps and deform into the variation rate of paper leaf 1 similarly. Therefore, since the gap of coils 4 and 5 does not change with the vibration even if paper leaf 1 vibrates and the thickness detection signal outputted from the thickness detector 20 does not change, either, it is always stabilized and the thickness of paper leaf 1 can be detected.

[0053] Moreover, the detection equipment 10 of the gestalt of this operation forms the elastic bodies 2 and 3 of the shape of a film of a pair across the conveyance side of paper leaf 1, and since it is the very easy configuration of only having arranged printed coils 4 and 5 to the point of elastic bodies 2 and 3, it

can constitute detection equipment 10 small and lightweight. Thus, an equipment configuration can be written small and lightweight, the flattery nature of coils 4 and 5 to the abrupt change of the thickness of paper leaf 1 is very good, it is stabilized and the thickness of the paper leaf 1 conveyed at high speed can be detected certainly.

[0054] Moreover, two or more detection equipments 10 which have an easy configuration as mentioned above can be installed crosswise which crosses the conveyance direction of paper leaf 1, detection equipment 100 which was explained by drawing 5 can be constituted easily, along the cross direction which crosses the conveyance direction of paper leaf 1, it can approach extremely, two or more coils 4 and 5 as a detector element can be installed, and the resolution of thickness detection of the paper leaf 1 which met crosswise can be raised.

[0055] As compared with the conventional detection equipment which has arranged the fixed roller and the movable roller across a conveyance side especially, according to the detection equipment 10 of the gestalt of this operation, it is not necessary to arrange the supporter material for supporting the both ends of a movable roller etc. between each roller, an equipment configuration can be simplified extremely, many coils 4 and 5 as a detector element can be arranged crosswise, and crosswise resolution can be raised. Moreover, according to the detection equipment 10 of the gestalt of this operation, it is not necessary to raise the location precision of a configuration member like the conventional equipment using a movable roller, and it can be stabilized, and the thickness of paper leaf can be detected certainly and easily, and equipment can be manufactured cheaply.

[0056] Moreover, with the detection equipment 10 of the gestalt of this operation, in order to form the clearance by the fluid layer between the points of elastic bodies 2 and 3 and to convey paper leaf 1 in the state of non-contact through this clearance, paper leaf 1 does not contact elastic bodies 2 and 3, elastic bodies 2 and 3 are worn out by the slide contact of paper leaf 1, a clearance does not change, and the output signal of detection equipment 10 does not change. Therefore, thickness detection stabilized semipermanently can be performed, and dependability can be raised while being able to raise detection precision. Moreover, since paper leaf 1 is conveyed in the state of non-contact in this way, any resistance cannot be found and paper leaf 1 can be conveyed smoothly.

[0057] Furthermore, since change of the coupled impedance of coils 4 and 5 is seen with the detection equipment 10 of the gestalt of this operation as compared with the conventional detection equipment which has arranged two optical reflective mold sensors across a conveyance side and the thickness of paper leaf 1 is detected, there is no change of the detection signal resulting from the color of paper leaf 1, and the thickness detection which was not influenced of the color of paper leaf 1 and stabilized is attained.

[0058] Another modification of the detection equipment 10 of the gestalt of the 1st operation mentioned above is shown in drawing 7. In addition, the same reference mark is given to the component which functions as the detection equipment 10 of the gestalt of the 1st operation mentioned above similarly, and detailed explanation is omitted here. Moreover, although the illustration abbreviation has been carried out here, the same configuration member also as the elastic body 3 of another side is attached.

[0059] With the detection equipment 10 of the gestalt of the 1st operation mentioned above, it is drawn in the direction (namely, direction which intersects perpendicularly with a conveyance side) which the elastic tubes 9a and 9b estrange mutually from a conveyance side through splices 11 and 12, respectively from the point of each elastic bodies 2 and 3 as shown, for example in drawing 1. Thus, since the elastic tubes 9a and 9b attached in the point of elastic bodies 2 and 3 are displaced together according to the variation rate of the point of elastic bodies 2 and 3, they can consider becoming the cause which spoils the flattery nature of elastic bodies 2 and 3.

[0060] For this reason, elastic tube 9a was connected to the elastic body 2 using the splice 30 which was bent by the abbreviation right angle which flowed in the hole 13 formed in the point of an elastic body 2 and which attaches and has hole 30a, and it constituted from a modification shown in drawing 7 so that elastic tube 9a might be prolonged along with elastic film 2a of the outside of an elastic body 2.

Thereby, as compared with the detection equipment 10 of the gestalt of the 1st operation mentioned above, the flattery nature according to the variation rate of the clearance in the point of an elastic body 2

was able to be raised.

[0061] Still more nearly another modification of the detection equipment 10 of the gestalt of the 1st operation is shown in drawing 8 . It explains only on behalf of the configuration which is in the conveyance side bottom also here.

[0062] On elastic film 2a of the outside of an elastic body 2, the elastic film 32 softer than elastic film 2a is minded [of lamination and this elastic film 32], flexible adhesives are minded outside through flexible adhesives, and another elastic film 34 is made to have rivaled in this modification. Slot 32a prolonged in the longitudinal direction through which it flows in the hole 13 which penetrated the elastic body 2 was formed in the center of abbreviation of the inside elastic film 32, and while flowing on the elastic film 34 of another side at the above-mentioned slot 32a, hole 34a was formed in the location estranged from the hole of an elastic body 2. Furthermore, elastic tube 9a was connected to the location which is in agreement with hole 34a on the lateral surface of the elastic film 34 through the splice 30 of the modification of drawing 7 mentioned above.

[0063] The compression gas sent in through elastic tube 9a is sent in towards a conveyance side through anchoring hole 30a of a splice 30, hole 34a of the elastic film 34, slot 32a of the elastic film 32, and the hole 13 of an elastic body 2. Thus, since elastic tube 9a was attached in the location estranged from the point of an elastic body 2 through the splice 30, a splice 30 and elastic tube 9a could be eliminated near the point of an elastic body 2, and the flattery nature of a point was able to be raised more.

[0064] In the detection equipment 100 of drawing 5 , the configuration for sending a compression gas into a conveyance side is shown in drawing 9 . Although only the configuration arranged above the conveyance side also here is illustrated, the same configuration also as the lower part of a conveyance side is arranged.

[0065] one elastic body 2' of the shape of a ctenidium which connected two or more elastic bodies 2 with one in that end face section in this configuration -- forming -- the external surface top of this elastic body 2' -- flexible adhesives -- minding -- abbreviation -- the elastic film 36 of the same configuration is minded [of lamination and this elastic film 36], flexible adhesives are minded outside, and another elastic film 38 is made to have rivaled Ctenidium-like slot 36a through which it flows in the hole 13 which penetrated each elastic body 2 was formed in one elastic film 36, and the hole (not shown) which flows in the above-mentioned slot 36a was formed in the elastic film 38 of another side. Furthermore, elastic tube 9a was connected to the location which is in agreement with the hole which the elastic film 38 does not illustrate through the splice 30 of the modification of drawing 7 mentioned above.

[0066] The compression gas sent in through elastic tube 9a is sent in towards a conveyance side through the hole 13 of slot 36a of the hole which a splice 30 and the elastic film 38 do not illustrate, and the elastic film 36, and the point of each elastic body 2.

[0067] In addition, although the modification of drawing 9 mentioned above explained the example which made the elastic films 36 and 38 rival on the top face of ctenidium-like elastic body 2', you may make it form a ctenidium-like slot (equivalent to slot 36a) in the top face of elastic body 2' directly. Moreover, you may make it form a slot in the top face of an elastic body 2 directly similarly in the modification explained by drawing 8 .

[0068] Next, the magnetic-substance detection equipment 40 (detection equipment 40 is only called hereafter) which detects the magnetic substance of the ink printed by the paper leaf conveyed at high speed as property detection equipment concerning the gestalt of implementation of the 2nd of this invention is explained.

[0069] The outline configuration of detection equipment 40 is shown in drawing 10 . Moreover, the top view which looked at this detection equipment 40 from the upper part of a conveyance side is shown in drawing 11 . Furthermore, the detail drawing which expanded near the point of the elastic bodies 2 and 3 of a pair is shown in drawing 12 . The detection equipment 40 explained below is the purpose which identifies paper leaf, and detects the magnetic substance of the ink printed by paper leaf. In addition, with the gestalt of this operation, the same sign is attached about the component which was mentioned above and which functions as the gestalt of the 1st operation similarly, and detailed explanation is omitted.

[0070] As shown in drawing 10, detection equipment 40 has the elastic bodies 2 and 3 of a pair by the physical relationship which faces across the conveyance side of paper leaf 1. As the points push each of each other's elastic bodies 2 and 3, they are supported by Supporters 6a and 6b. While is above the conveyance side and the detector element 50 which piled up the permanent magnet 44 on the magnetic resistance element 42 is carried in the point of an elastic body 2. This detector element 50 detects the magnetic substance of the ink printed by the paper leaf 1 which passes through a conveyance side.

[0071] It is attached on elastic film 2b inside one elastic body 2 so that a detector element 50 may make a magnetic resistance element 42 approach drawing 12 as much as possible at the paper leaf 1 which passes through a conveyance side as shown in a detail. That is, to the point of one elastic body 2, 2d of mounting holes of a ***** rectangle was formed, and the detector element 50 has fixed outside elastic film 2a and viscous-element 2c through adhesive adhesives in 2d of this hole.

[0072] Moreover, a magnetic resistance element 42 has two configuration components 42a and 42b located in a line along the conveyance direction of paper leaf 1. With the gestalt of this operation, it has arranged so that two configuration components 42a and 42b may serve as the equal distance from a conveyance side and it may become parallel to a conveyance side. In addition, 2 sets of configuration components (four configuration components) may be installed crosswise [of paper leaf 1]. Thus, since all configuration components become the same temperature even if it is the case where surrounding temperature changes by connecting by the bridge circuit which prepares two or more configuration components and mentions them later, the output change to change of ambient temperature can be prevented. In addition, a permanent magnet 44 gives magnetic bias to each configuration components 42a and 42b of a magnetic resistance element 42. Moreover, the terminal lines 7a and 7b of a magnetic resistance element 42 are connected to the circuit mentioned later.

[0073] It is the location estranged from the point of each elastic bodies 2 and 3, and the supplied-air tubes 46 and 48 for sending in a compression gas between the point of each elastic bodies 2 and 3 and paper leaf 1 are arranged between elastic film 2b inside each elastic bodies 2 and 3, 3b, and paper leaf 1. It is constituted by the elastic tube, the tip is turned between the points of elastic bodies 2 and 3, and the supplied-air tubes 46 and 48 are arranged in the location fully estranged from the conveyance side so that the paper leaf 1 conveyed through a conveyance side might not be contacted.

[0074] A deer is carried out, if compression gases, such as air compressed into the predetermined pressure through the supplied-air tubes 46 and 48, are sent in, it can extend in the direction (an arrow head B, an arrow head C) which the point of each elastic bodies 2 and 3 repels mutually, and a fixed clearance will be formed among both. And if paper leaf 1 is conveyed in the direction of drawing Nakaya mark A through this clearance, shortly, a fixed clearance will be formed between the point of each elastic bodies 2 and 3, and paper leaf 1, and paper leaf 1 will be conveyed in the state of non-contact to elastic bodies 2 and 3. In this condition, the distance between the top face of paper leaf 1 and each configuration components 42a and 42b of a magnetic resistance element 42 is held uniformly.

[0075] The outline configuration of the property detection equipment 200 (detection equipment 200 is only called hereafter) as a modification which installed two or more detection equipments 40 of the gestalt of the 2nd operation constituted as mentioned above in drawing 13 side by side along the conveyance direction of paper leaf 1 and the direction (cross direction) which intersects perpendicularly is shown as a top view. This detection equipment 200 carries out support immobilization of the detection equipment 40 mentioned above, n detection equipments 40a, 40b, 40c, 40d, and 40e constituted similarly, and the end face section of each —40n elastic bodies 2 and 3 with one supporter 60, and is constituted.

[0076] With this detection equipment 200, the amount of magnetic substance of the ink printed by paper leaf 1 through each detector element 50 carried in two or more elastic bodies 2 is detected, and distribution of the magnetic substance which met crosswise [of paper leaf 1] is detected.

[0077] By processing the detection signal about the amount of magnetic substance of the paper leaf outputted to drawing 14 through the detection equipment 40 (200) mentioned above has shown the block diagram of the magnetic-substance detector 70 which detects the amount of magnetic substance of paper leaf.

[0078] As shown in drawing 14, a bridge circuit 72 connects the variable resistor r for adjusting the balance of resistance with a serial with two fixed resistors $R1$ and $R2$ and two configuration components 42a and 42b of the magnetic resistance element 42 of the detection equipment 40 mentioned above, and is constituted.

[0079] A voltage stabilizer 74 supplies and energizes direct current voltage to a bridge circuit 72. The direct current voltage from a voltage stabilizer 74 is supplied to a differential amplifying circuit 76 as a value pressured partially by the value pressured partially by a resistor $R1$ and configuration component 42a, and a resistor $R2$ and configuration component 42b. The signal about the amount of magnetic substance according to the resistance value change of the configuration components 42a and 42b detected through this differential amplifying circuit 76 is further amplified through a filter and an amplifying circuit 78, and is outputted as a detection signal about the amount of magnetic substance of the band of a need frequency.

[0080] First, when detecting the magnetic substance of the ink printed by paper leaf 1, as shown in drawing 10 and drawing 12, a compression gas is sent in between the elastic body 2 of a pair, and 3 through the supplied-air tubes 46 and 48, the fixed clearance by thin liquid film is formed among both, and paper leaf 1 is conveyed in the direction of arrow-head A along a conveyance side through a clearance in this condition.

[0081] If paper leaf 1 passes the elastic body 2 of a pair, and the fluid layer between three, an elastic body 2 can be extended in the direction of drawing Nakaya mark B, and the elastic body 3 of another side can extend while the detector element 50 was carried in the direction of drawing Nakaya mark C. In this condition, liquid film with thin, respectively fixed thickness is formed between one elastic body 2 and the top face of paper leaf 1, and between the elastic body 3 of another side, and the inferior surface of tongue of paper leaf 1. The distance between the configuration components 42a and 42b of a magnetic resistance element 42 and paper leaf 1 is kept constant by the liquid film especially formed between the top face of paper leaf 1, and the elastic body 2 which carried the detector element 50.

[0082] Thus, in case the magnetic substance of the ink of paper leaf 1 passes the configuration components 42a and 42b of the magnetic resistance element 42 arranged in the state of a float from the paper leaf 1 under conveyance at a fixed distance, the resistance changes. The resistance of each configuration components 42a and 42b changes in proportion to the amount of the magnetic substance. Thus, if the resistance of each configuration components 42a and 42b changes, the balance condition of a bridge circuit 72 of having explained using drawing 14 will collapse, the output of a differential amplifying circuit 76 will change, and the output signal of a filter and an amplifying circuit 78 will change. That is, change of this output signal is detected and the magnetic substance of the ink of paper leaf 1 is detected.

[0083] If distribution of the amount of magnetic substance of paper leaf 1 or distribution of permeability is uniform when detecting the magnetic substance of paper leaf 1, the resistance of the configuration components 42a and 42b will become the same, and change will not be produced in the output signal of the magnetic-substance detector 70 mentioned above. On the other hand, if distribution of the amount of magnetic substance or permeability is uneven, a difference will be produced in the resistance of the configuration components 42a and 43b, and change will be produced in the output signal of the magnetic-substance detector 70. that is, the case where deflection is in the amount of magnetic substance of paper leaf 1, or permeability distribution with the detection equipment 40 of the gestalt of this operation -- a detecting signal -- it can output -- space -- difference -- an output can be obtained.

[0084] As mentioned above, according to the gestalt of this operation, a compression gas is sent in between the points of the elastic bodies 2 and 3 of a pair, the clearance by liquid film is formed among both, paper leaf is conveyed in the state of non-contact through this clearance, and the magnetic substance of the ink printed by paper leaf is detected. Therefore, also in the detection equipment 40 of the gestalt of this operation, the same effectiveness as the gestalt of the 1st operation mentioned above can be done so.

[0085] That is, since paper leaf can be conveyed in the state of non-contact through the clearance between the points of the elastic bodies 2 and 3 of a pair also in the detection equipment 40 of the gestalt

of this operation, When paper leaf vibrates un-wanting, make elastic bodies 2 and 3 follow a high speed, and they carry out a variation rate to vibration of paper leaf. The distance between a detector element 50 and paper leaf can be held uniformly, the level of the detection signal by the detector element 50 can always be stabilized, and the reliable detection result of having been stabilized can be obtained.

[0086] Moreover, since according to the detection equipment 40 of the gestalt of this operation the detector element 50 had two or more configuration components 42a and 42b and has connected by the bridge circuit 72, the output change resulting from a surrounding temperature change can be prevented.

[0087] Another modification of the detection equipment 40 of the gestalt of the 2nd operation mentioned above is shown in drawing 15. In addition, the same reference mark is given to the component which functions as the detection equipment 40 of the gestalt of the 2nd operation mentioned above similarly, and detailed explanation is omitted here.

[0088] In the modification shown in drawing 15, the detector element 80 is carried in the point of one elastic body 2. This detector element 80 is equipped with the spacer 82 between configuration component 42b of another side, and inside elastic film 2b so that it may be in the tip side of an elastic body 2 and the direction of configuration component 42b of another side which is in the back end side of an elastic body 2 from configuration component 42a may be arranged in the location distant from the conveyance side.

[0089] Thus, by making configuration component 42b of another side estrange from a conveyance side rather than one configuration component 42a, the effect by the magnetic substance or the permeability of the paper leaf to configuration component 42b of another side becomes smaller than the thing to one configuration component 42a, and the resistance value change of configuration component 42b also becomes small. Therefore, the resistance value change of one configuration component 42a becomes dominant, and the output from the magnetic-substance detector 70 will detect the amount of magnetic substance or permeability of paper leaf by configuration component 42a which is one side in general, and can detect distribution of the magnetic substance in paper leaf, or permeability.

[0090] Moreover, in order to make configuration component 42b of another side estrange from a conveyance side from one configuration component 42a, the detector element 50 of the gestalt of the 2nd operation mentioned above is made to have inclined at an angle of predetermined in the another modification to the pan shown in drawing 16.

[0091] Thus, by making a detector element 50 incline, the distance from the conveyance side of each configuration components 42a and 42b can be changed, and the magnetic substance of paper leaf or distribution of permeability can be detected.

[0092] Next, the magnetic-substance detection equipment 90 (detection equipment 90 is only called hereafter) which detects the magnetic substance of the ink printed by the paper leaf conveyed at high speed as property detection equipment concerning the gestalt of implementation of the 3rd of this invention is explained. The outline configuration of detection equipment 90 is shown in drawing 17 and 1717. Moreover, the top view which looked at the upper part of this detection equipment 90 from the conveyance side side (B-B side in drawing) is shown in drawing 18.

[0093] As shown in drawing 17, detection equipment 90 has the guide bases 91 and 92 (plate-like part material) of a pair by the physical relationship which faces across the conveyance side of paper leaf 1. Each guide bases 91 and 92 are attached in the supporter 100 through flat springs 93 and 94, respectively. each flat springs 93 and 94 -- each guide bases 91 and 92 -- mutual -- abbreviation -- it energizes in the direction which makes an parallel posture and is mutually forced through a conveyance side.

[0094] thickness with the fixed guide bases 91 and 92 of a pair -- having -- abbreviation -- it is formed in the same structure and has the opposed faces 91a and 92a which have predetermined die length along the conveyance direction of paper leaf 1, respectively. The guide bases 91 and 92 of a pair are arranged so that each opposed face 91a and 92a may counter through a conveyance side and it may become abbreviation parallel. As illustrated to drawing 18, it has opposed face 91a of an even rectangle which has the fixed width of face which the guide base 91 extends long enough along the conveyance direction of paper leaf 1, and crosses the conveyance direction while it was prepared above the conveyance side.

[0095] The fluid manifold 96 (supplied-air means) for sending in a compression gas towards a conveyance side through the magnetometric sensor 95 (detector element) for detecting the magnetic substance of the ink printed by paper leaf 1 and two or more holes which the guide base 91 mentions later is attached in the guide base 91 prepared above the conveyance side. On the other hand, fluid manifold 96' (supplied-air means) for sending in a compression gas towards a conveyance side through two or more holes which the guide base 92 mentions later is attached in the guide base 92 in which the conveyance side was established caudad.

[0096] The magnetometric sensor 95 attached in the guide base 91 has the core 103 which ****(ed) a primary coil 101, the dummy coils D1 and D2 of 102 or 2 secondary coils, and these four coils. A core 103 has the gap G2 estranged from the gap G1 arranged so that it may become flat-tapped with opposed face 91a of the guide base 91, and the conveyance side. A magnetometric sensor 95 **** a primary coil 101 and a secondary coil 102 on both sides of the gap G1 of the side close to a conveyance side, **** two dummy coils D1 and D2 on both sides of the gap G2 of the side estranged from the conveyance side, and is constituted. This magnetometric sensor 95 is laid under the guide base 91 so that one gap G1 may be made to approach the front face of the paper leaf 1 which passes through a conveyance side as much as possible. In addition, the terminal line which each coil does not illustrate is connected to the circuit mentioned later.

[0097] Moreover, the fluid manifold 96 attached in the guide base 91 is formed so that a magnetometric sensor 95 may be covered. The fluid manifold 96 has the supplied-air way 104 for sending a compression gas into a conveyance side through two holes 97 and 98 (refer to drawing 18) prepared by penetrating the guide base 91 by the physical relationship which sandwiches a magnetometric sensor 95 along the conveyance direction of paper leaf 1. The splice 105 for connecting the elastic tube which is not illustrated is formed in the end face section of the supplied-air way 104. The compression gas sent into the fluid manifold 96 through the elastic tube and splice 105 which carry out a deer, and which are not illustrated is sent into a conveyance side through two holes 97 and 98 through the supplied-air way 104.

[0098] the fluid manifold 96 which, on the other hand, also mentioned above fluid manifold 96' attached in the guide base 92, and abbreviation — although it has the same structure, since the magnetometric sensor is not covered, size is somewhat small. Here, 'is given to the same sign and it is shown in the part which functions as the fluid manifold 96 mentioned above similarly. In addition, it is formed in the holes 97 and 98 of two hole 97' formed in the guide base 92, and the guide base 91 which 98' mentioned above, and the location which counters in order to send a compression gas into a conveyance side. Moreover, the size of a fluid manifold can be changed suitably.

[0099] a deer -- carrying out -- not illustrating -- elasticity -- a tube -- a splice -- 105 -- 105 -- ' -- a supplied air -- a way -- 104 -- 104 -- ' -- and -- a hole -- 97 -- 98 -- 97 -- ' -- 98 -- ' -- minding -- predetermined -- a pressure -- having compressed -- air -- etc. -- compression -- a gas -- a pair -- a guide -- the base -- 91 -- 92 -- between -- sending in -- if -- each -- a flat spring -- 93 -- 94 -- energizing -- having -- **** -- a condition -- a pair -- a guide -- the base -- 91 -- 92 -- mutual -- opposing -- a direction -- extending -- having -- . thereby -- the guide bases 91 and 92 of a pair -- a fixed clearance is formed between each opposed face 91a and 92a. And if paper leaf 1 is conveyed in the direction of drawing Nakaya mark A through this clearance, shortly, a fixed clearance will be formed between the opposed faces 91a and 92a of each guide bases 91 and 92, and paper leaf 1, and a compression gas will flow in the direction of an arrow head of drawing 17 R> 7. Thereby, paper leaf 1 is conveyed along a conveyance side in the state of non-contact to the guide bases 91 and 92.

[0100] At this time, between the guide bases 91 and 92 of a pair, and paper leaf 1, it originates in the flow of a compression gas, negative pressure smaller than the pressure of a compression gas acts, and the clearance by balance of the rate-of-flow effectiveness is formed. That is, the negative pressure extremely stabilized between the opposed faces 91a and 92a of a comparatively large area and paper leaf 1 arises, a large area is covered, and a clearance is stabilized. A deer is carried out, the distance between the top face of paper leaf 1 and opposed face 91a of the guide base 91 is uniformly held by this clearance, and the distance between the gap G1 of a magnetometric sensor 95 and paper leaf 1 is kept

constant. In addition, this clearance is decided by the load rate of the flat springs 93 and 94 which support the pressure of a compression gas, the rate of flow, an atmospheric pressure, and the guide bases 91 and 92 of a pair etc., and with the gestalt of this operation, each parameter is installed so that this clearance may become several microns thru/or about dozens of microns.

[0101] By processing the detection signal about the amount of magnetic substance of the paper leaf outputted to drawing 19 through the detection equipment 90 mentioned above has shown the block diagram of the magnetic-substance detector 110 (a detector 110 is only called hereafter) which detects the amount of magnetic substance of paper leaf.

[0102] As shown in drawing 19, a detector 110 has the bridge circuit 113 which contains in a component the coil 111 which connected to the serial the primary coil 101 shown in drawing 17, and the secondary coil 102, and the coil 112 which connected the dummy coils D1 and D2 to the serial. a bridge circuit 113 — in addition, R1 and R2 as side resistance, and VR1 and VR2 as a variable resistor for balance adjustment are included as a component.

[0103] Moreover, a detector 110 has the oscillator circuit 114 which energizes a bridge circuit 113, the differential amplifier 115, the phase simulation detector circuit 116, phase setting circuitry 117, and a filter circuit 118.

[0104] In a bridge circuit 113, if the magnetic substance of the paper leaf 1 which passes through a conveyance side which adjusts VR1 and VR2 is detected and the impedance of a coil 111 changes so that the output wave amplitude of the differential amplifier 115 may become as small as possible, the output wave of the differential amplifier 115 and the amplitude will change. The phase simulation detector circuit 116 carries out detection rectification of the signal from the differential amplifier 115 under the phase set up in phase setting circuitry 117. Phase setting circuitry 117 sends the signal with which only the phase set up to the input wave from an oscillator circuit 114 shifted to the phase simulation detector circuit 116, and when the paper leaf 1 used as the candidate for detection passes through the inside of detection equipment 90, it sets up a setting phase so that the output of a bridge circuit 113 may become max. Moreover, you may make it the noise component which becomes harmful to a detecting signal serve as min in this phase setup. The filter circuit 118 for low pass removes the high frequency component of the signal detected in the phase simulation detector circuit 116. Moreover, the function to change the voltage level of an output signal may be given to a filter circuit 118. A deer is carried out and the signal about the magnetic substance of the paper leaf 1 which passes through a conveyance side is outputted through a filter circuit 118.

[0105] According to the gestalt of this operation, it faces across the conveyance side of paper leaf 1. As mentioned above, comparatively large opposed face 91a, The holes 97 and 98 of two each which penetrated each guide bases 91 and 92 by the physical relationship which forms the guide bases 91 and 92 of the pair which has 92a, and sandwiches a magnetometric sensor 95 along the conveyance direction of paper leaf 1, 97', 98' is formed and the compression gas was sent in between large opposed face 91a and 92a from the both sides of a magnetometric sensor 95 through these holes. While being able to do so by this the same effectiveness as the gestalt of each operation mentioned above, the guide base 91 of a pair and the clearance between 92 can be stabilized more in order (several microns thru/or dozens of microns), the distance between a detector element and paper leaf can be stabilized more, and the magnetic substance of the ink printed by paper leaf 1 can be detected more to high degree of accuracy. Moreover, even if it is the case where the paper leaf 1 which passes through a conveyance side vibrates in the direction of a field un-wanting, in order that the guide bases 91 and 92 currently supported by flat springs 93 and 94 may follow and move to vibration of paper leaf 1, the distance between paper leaf and a magnetometric sensor 95 does not change.

[0106] The modification of the detection equipment 90 of the gestalt of the 3rd operation mentioned above is shown in drawing 20. the detection equipment 90 which mentioned this detection equipment 120 above, and abbreviation — although it has the same configuration, it differs in that magnetometric sensor 95' is attached also in the guide base 92 in which the conveyance side was established caudad. That is, the detection equipment 120 of this modification has a magnetometric sensor 95 and 95' on both sides of a conveyance side. Connect 'a secondary coil 102' to a serial and a coil 111 (drawing 19) is

constituted. in this case, the primary coil 101 of the magnetometric sensor 95 of a conveyance side top, a secondary coil 102, and the primary coil 101 of magnetometric sensor 95' of the conveyance side bottom -- a magnetometric sensor -- 95 -- a dummy -- a coil -- D -- one -- D -- two -- and -- a magnetometric sensor -- 95 -- ' -- a dummy -- a coil -- D -- one -- ' -- D -- two -- ' -- a serial -- connecting -- a coil 112 (drawing 19) -- it constitutes -- ****ing -- the detector 110 of drawing 19 -- using -- the magnetic substance of paper leaf 1 -- being detectable .

[0107] In addition, this invention is not limited to the gestalt of operation mentioned above, and is variously deformable within the limits of this invention. For example, although the gestalt of operation mentioned above explained the case where a compression gas was sent in between the points of the elastic body of a pair using an elastic tube or a slot, the supplied-air means and the supplied-air approach of not only this but a compression gas may be what kind of thing.

[0108] Moreover, although what wound around the core two or more coils mentioned above as a magnetometric sensor 95 and 95' was used with the gestalt of the 3rd operation, the magnetic resistance element of the conventional differential-winding mold transformer method, an annular core impedance method, or the gestalt of the 2nd operation etc. may be used instead.

[0109]

[Effect of the Invention] As explained above, since the property detection equipment of paper leaf using the compression gas of this invention has above configurations and operations, it can always hold uniformly the distance between the paper leaf and detector elements which are conveyed at high speed, and can obtain the reliable detection result of having been stabilized.

[Translation done.]